

Seasonal variation in soil-P levels

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Numerous papers have illustrated the value of the Bicarbonate - P soil test as a guide to pasture response to applied superphosphate (1,2). This paper presents results from a grazing experiment in which soil P levels were monitored over a three-year period at a range of superphosphate applications.

Methods

Single, annual treatments of high grade superphosphate were applied to each of four 1.7 hectare paddocks at the rates of 0, 62.5, 125 and 250 kg ha⁻¹. The paddocks were stocked with 12 Polwarth ewes per hectare. In October of each year three marked positions in each paddock were core sampled to a depth of 100 mm with 10 cores per sample each 20 mm in diameter. Samples were analysed for bicarbonate - P levels (3). Pasture growth was monitored in 35-45 day periods using pasture enclosure cages and the Massey grass meter (4).

Results and Discussion

Table 1 summarises the various results for the three years.

Table 1. October Dry Matter Production and Soil P Levels in Each Year

Superphosphate (a) treatment	1981		1982		1983	
	Growth (b)	Soil P (c)	Growth	Soil P	Growth	Soil P
0	105	16	5	26	73	28
62.5	115	22	11	29	78	32
125	144	32	13	45	112	37
250	156	34	24	62	131	56
L.S.D. (P = 0.05)	21	10	6	11	29	14
Rainfall (d)	104%		69%		84%	

where (a) = Kg ha⁻¹ (b) = Kg ha⁻¹ day⁻¹ (c) = ppm bicarbonate P
(d) = annual rainfall as % average.

In the dry year, 1982 there was a marked increase in soil P levels over the previous year, even in the nil-P treatment (Table 1). This may be explained by the mineralisation of soil organic matter in the summer of 1981, followed by minimal depletion of soil-P due to very poor pasture growth in the subsequent goring.

Year	Equation	r ²
1981	yield ^(e) = 57.5 + 2.8 p (f)	0.97
1982	yield = -5.2 + 0.5 p	0.91
1983	yield = 19.7 + 2.1 p	0.85
All years	yield = 99.9 + 0.6 p	0.02

where (e) = Kg ha⁻¹ day⁻¹ (f) = ppm bicarbonate P

The equations relating October pasture growth and soil-P level for each year, and all years are contained in Table 2.

Despite the strong relationship between pasture production and soil-P level within each year, there was no such relationship when the three years' data were combined. The masking effect of between year differences partly explains the difficulty experienced by producers in utilising soil tests as a guide to determining superphosphate strategies.

1. Helyar, K.R. and Spencer, K. 1977. Aust. J. Soil Res. 15, 263-273.

2. Spencer, K., Bouma, D. and Moye, D.V. 1969. Aust. J. Exp. Agric. Anim. Husb. 9, 320-328.
3. Colwell, J.D. 1963. Aust. J. Exp. Agric. Anim. Husb. 3, 190-193.
4. Holmes, C.W. 1974. Dairy Farming Annual. Massey University, p. 27.